Strictly Confidential: (For Internal and Restricted use only)
Secondary /Senior School Certificate Examination
September 2020
Marking Scheme – BIOLOGY (044)
(PAPER CODE –57 / C / 1/2/3)

General Instructions: -

1. You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.**Evaluation is a 10-12 days mission for all of us. Hence, it is necessary that you put in your best effortsin this process.**
2. Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed.**However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and marks be awarded to them.**
3. The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
4. Evaluators will mark(") wherever answer is correct. For wrong answer 'X" be marked. Evaluators will not put right kind of mark while evaluating which gives an impression that answer is correct and no marks are awarded. This is most common mistake which evaluators are committing.
5. If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.
6. If a question does not have any parts, marks must be awarded in the left hand margin and encircled.This may also be followed strictly.
7. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.
8. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
9. A full scale of marks 70 has to be used. Please do not hesitate to award full marks if the answer deserves it.
10. Every examiner has to necessarily do evaluation work for full working hours i.e. 8 hours every day and evaluate 20 / 25 answer books per day.

11. Ensure that you do not make the following common types of errors committed by the Examiner in the past:-

    - Leaving answer or part thereof unassessed in an answer book.
    - Giving more marks for an answer than assigned to it.
    - Wrong transfer of marks from the inside pages of the answer book to the title page.
    - Wrong question wise totaling on the title page.
    - Wrong totaling of marks of the two columns on the title page.
    - Wrong grand total.
    - Marks in words and figures not tallying.
    - Wrong transfer of marks from the answer book to online award list.
    - Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.)
    - Half or a part of answer marked correct and the rest as wrong, but no marks awarded.

12. While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as (X) and awarded zero (0)Marks.

13. Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.

14. The Examiners should acquaint themselves with the guidelines given in the Guidelines for spot Evaluation before starting the actual evaluation.

15. Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.

16. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges.

SECTION – A

Q. Nos. 1 - 5 are of one mark each

1. In the illustration given below of a simplified food web on an island, the arrows indicate the direction of energy flow and the Roman numbers indicate species within the food web.

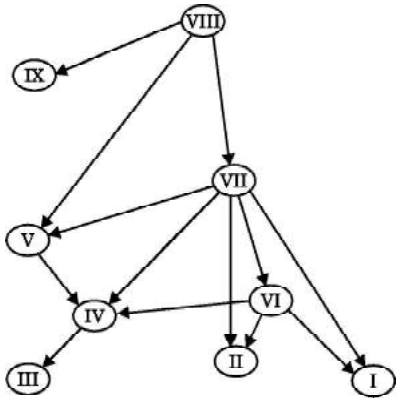
At which trophic level or levels does the species VIII function ?

(A) 2nd and 3rd consumer

(B) 1st consumer

(C) Producer

(D) 3rd and 4th consumer



Ans. (C) / Producer

[1 mark]

2. Some cyanobacteria in aquatic and terrestrial environment that enrich the soil by fixing atmospheric nitrogen are

(A) Rhizobium and Azotobacter

(B) Azospirillum and Glomus

(C) Anabaena and Nostoc

(D) Azospirillum and Azotobacter

Ans. (C) / *Anabaena and Nostoc*

OR

Colostrum provides passive immunity to human infants as it contains antibody

(A) IgA

(B) IgM

(C) IgE

(D) IgG

Ans. (A) / IgA

[1 mark]

3. The specific site for fertilisation in human female is

(A) Infundibulum

(B) Uterus

(C) Ampulla

(D) Ampullary isthmic junction

Ans. (C) / Ampulla

// (D) / Ampullary isthmic junction

OR

The hormone that regulates the synthesis and secretion of androgens in human males is1

(A) GH

(B) FSH

(C) LH

(D) Prolactin

Ans. (C) / LH

[1 mark]

4. In biotechnology experiments, 'molecular scissors' used are

(A) Plasmid

(B) Restriction enzymes

(C) Vectors

(D) Sigma factor

Ans. (B) / Restriction enzymes

[1 mark]

5. 'Cry genes' that code for insecticidal toxins are present in

(A) Cotton bollworms

(B) Nematodes

(C) Corn borer

(D) Bacillus thuringiensis

Ans. (D) / *Bacillus thuringiensis*

[1 mark]

SECTION B

Q. Nos. 6 - 12 are of two marks each

6. Why do some organisms enter into diapause while some others into aestivation ? Give one example each of such organisms.

Ans. Diapause – To avoid unfavourable condition , eg.-Zooplankton = ½ + ½

Aestivation – To avoid summer related problem / to avoid heat / desiccation , eg.- Snail / Fish = ½ + ½

[1+ 1 = 2 marks]

7. Mendel did not explain the expression of incomplete dominance in plants. Give an example of flower exhibiting incomplete dominance.

Name and state the Law of Mendel the genes which exhibit incomplete dominance follow.

Ans. *Antirrhinum* / Snapdragon / Dog flower / Four o'clock plant / *Mirabilis jalapa* = 1

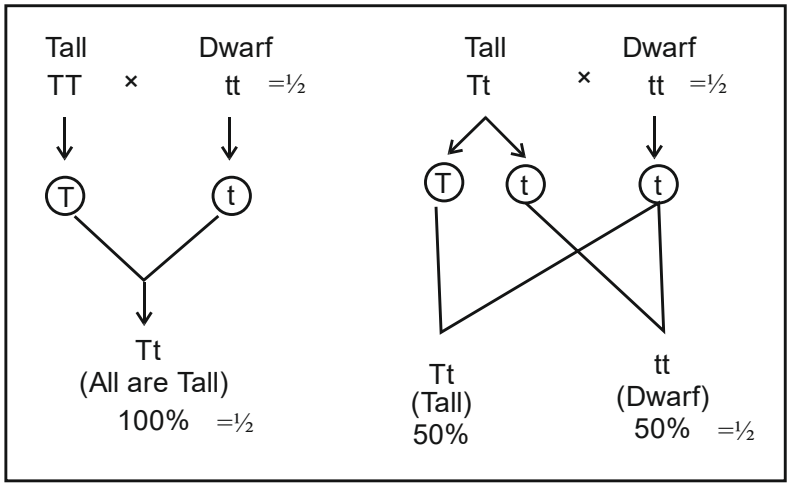
Law of segregation = ½ , Allele/factors of a pair segregate from each other such that a gamete receives only one of the two factors = ½

[1 + ½ + ½ = 2 marks]

OR

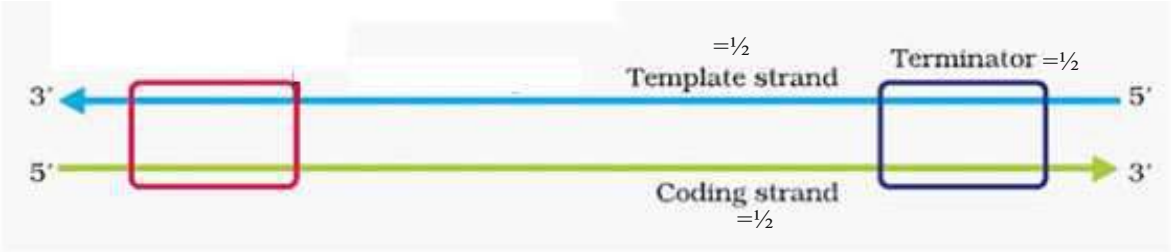
Your teacher gave you a tall pea plant and asked you to find whether the plant is homozygous tall or heterozygous tall. How will you proceed to find the genotype of the given plant ?

Test Cross



[½ × 4 = 2 marks]

8. Draw a schematic diagram of a transcription unit with the polarity of the DNA strands and label coding strand, template strand and terminator.



Correct polarity = ½

[½ × 4 = 2 marks]

9. Causative organisms of some diseases gain entry into human body through mosquito bites and make humans suffer from the disease.

Name one such :

(i) protozoan disease along with the scientific name of the causative organism.

(ii) helminthes disease along with the scientific name of the causative organism.

Ans. (i) Malaria , *Plasmodium vivax / Plasmodium malaria / Plasmodium falciparum* = ½ + ½

(ii) Elephantiasis / Filariasis , *Wuchereria bancrofti / Wuchereria malayi* = ½ + ½

[1 + 1 = 2 marks]

10. What is 'bagging' ? State its importance in artificial hybridization of flowering plants.

Ans. Bagging - Process of covering of emasculated / female / artificially pollinated flowers with a bag of suitable size generally made up of butter paper (to prevent contamination of stigma with unwanted pollen) = 1

Importance – The desired pollen grains are used for pollination / the stigma is protected from contamination from unwanted pollen / It combines desirable characters to produce commercially superior varieties = 1

[1 + 1 = 2 marks]

11. (a) Mention the difference in the level of BOD before and after the secondary treatment of sewage water.

(b) Write the importance of 'flocs' during the secondary treatment of sewage.

Ans. (a) Before - High = ½ , After – Low = ½

(b) Reduces BOD / Biochemical Oxygen Demand = 1

[1 + 1 = 2 marks]

12. Explain the action of EcoRI on DNA in rDNA technology experiment.

Ans. - It cuts vector and foreign DNA at specific sites (palindromic nucleotide sequence / GAATTC / between G & A on the opposite strands) ,

- forming sticky ends ,

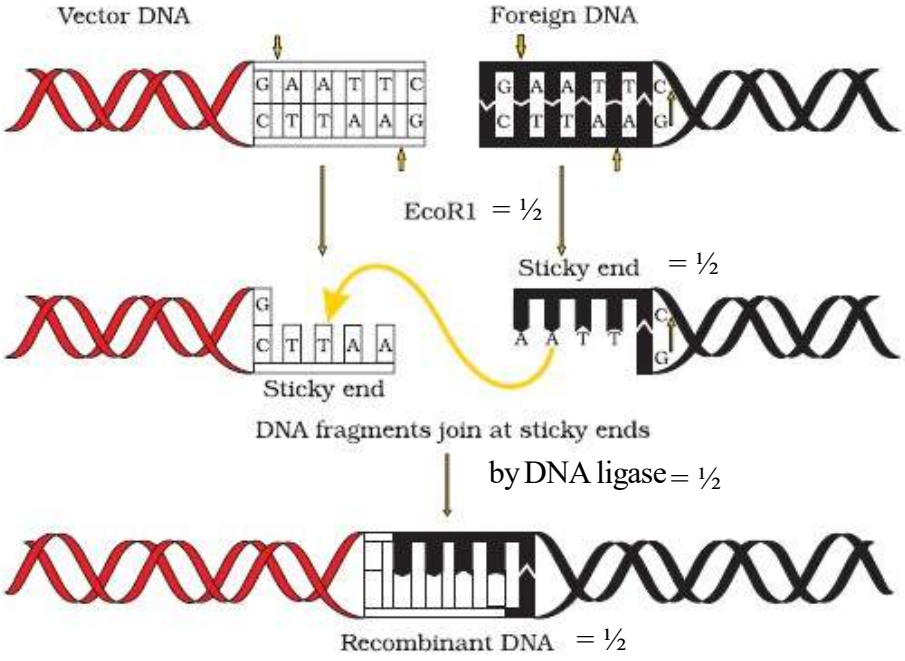
- that facilitates the action of DNA ligase ,

- to form recombinant DNA / recombinant plasmid = ½ × 4

[½ × 4 = 2 marks]

//

(In lieu of the above explanation , the following diagram with the given marking point can be considered)



[½ × 4 = 2 marks]

SECTION C

Q. Nos. 13 - 21 are of three marks each

13. Why does an organic farmer intentionally not use toxic chemicals to kill the pests which damage his crops ? Explain giving three reasons.

Ans. - Toxic chemicals can have adverse side effects / causes biomagnification ,

- It kills both useful and harmful life forms indiscriminately,
- It eradicates pests not control pests ,
- Beneficiary predatory and parasitic insects which depend upon them as food or hosts would not able to survive ,
- It disturbs food chain / food webs / vibrant ecosystem (Any Three) = 1 × 3

[3 marks]

14. Name the three different parts of a human sperm and write their involvement in the process of fertilisation.

Ans. Acrosome = ½ , filled with enzyme which helps the sperm to enter into the ovum (through zona pellucida)= ½

Nucleus = ½ , containing chromosomal material / genetic material = ½

Mitochondria / Middle piece = ½ , energy source for swimming = ½

Tail = ½ , it helps in movement / motility = ½

Plasma membrane = ½ , sperm is enveloped by it = ½ (Any Three) = 1 × 3

[3 marks]

15. Why do doctors suggest some married couples to go for 'IVF' ? Explain the steps carried out in the process of 'IVF'.

Ans. - (Childless) couples could be assisted to have children through IVF = 1

- Ova from the wife / donor (female) and sperm from the husband /donor(male) are collected , and are induced to form zygote under simulated conditions in the laboratory, the zygote or early embryos (with upto 8 blastomeres)could then be transferred into fallopian tube(ZIFT), and embryos with more than 8 blastomeres transferred into uterus(IUT) = ½ × 4

[1 + 2 = 3 marks]

16. Explain the events occurring in a 'Replicating Fork' during replication of DNA.

Ans. - DNA dependent DNA polymerase catalyse polymerisation ,

- of deoxynucleotides / deoxyribonucleotside triphosphates ,

- only in one direction 5'→3' ,

- on one strand (the template with polarity 3'→5') the replication is continuous ,

- while on the other (the template with polarity 5'→3') it is discontinuous,

- the discontinuously synthesised fragments are later joined by the enzyme DNA ligase = ½ × 6

[½ × 6 = **3 marks]**

OR

Name the different types of RNA polymerases in a eukaryotic cell. Write their roles in transcription.

Ans. - RNA polymerase I= ½ , transcribes rRNAs(28S/18S/5.8S) = ½

- RNA polymerase II= ½ , transcribes precursor of mRNA/hnRNA/heterogenous nuclear RNA = ½

- RNA polymerase III = ½ , transcribes tRNA/ 5srRNA/ snRNAs / small nuclear RNAs = ½

[½ × 6 = 3 marks]

17. Why are poultry farms set up ? Write the different components to be kept in mind in poultry farm management.

Ans. Used for food / meat / eggs = 1

- Selection of disease free and suitable breeds ,

- proper and safe farm conditions ,

- proper feed and water ,

- and hygiene and health care = ½ × 4

[1 + 2 = 3 marks]

18. Describe the technique that is very effectively used to get a large amount of desired DNA for research and detailed investigation.

Ans. - By using PCR (polymerase chain reaction) denaturation of desired DNA ,

- separate into 2 strands where each acting as template ,
- for each strand a separate set of primer used (two primers) ,
- with the help of deoxy(ribo) nucleotides and Taq polymearse (DNA polymearase isolated from *Thermus aquaticus)* ,
- results in extension of DNA primer = ½ × 6

[½ × 6 = 3 marks]

19. What are transgenic animals ? How are they being used for vaccine safety and chemical safety testing ? Explain.

Ans. Transgenic animals – : Animals that have had their DNA manipulated to possess and express an extra/foreign/trans gene = 1

- Transgenic mice are being developed for use in testing the safety of vaccine before they are used in humans / transgenic mice are being used to test the safety of polio vaccine , if successful and found reliable they could replace the use of monkeys to test the safety of batches of the vaccine = ½ × 2
- Transgenic animals are made that carry genes which make them more sensitive to toxic substances than non-transgenic animals , they are exposed to the toxic substances and the effects are studied (that allows to obtain results in less time) = ½ × 2

[1 + 1 + 1 = 3 marks]

20. Differentiate between pleiotropy and polygenic inheritance by taking one example of each.

Ans.

Pleiotropy	**Polygenic Inheritance**
a single gene can exhibit multiple phenotypic expression = 1	Inheritance which are generally controlled by three or more genes = 1
eg.- Phenylketonuria / mutation of a gene coding for phenylalanine hydroxylase can manifests multiple phenotypic expression(mental retardation and a reduction in hair and skin pigmentation) / a single gene in garden pea control the size of starch grain and seed shape = ½	eg.-Human skin colour controlled by three genes (A,B,C) = ½

[1 + 1 + ½ + ½ = 3 marks]

OR

State Oparin and Haldane hypothesis. How did S.L. Miller experimentally prove it ? Explain.

Ans. First form of life could have come from pre-existing non-living molecules (DNA/protein) , and that formation of life was preceded by chemical evolution (formation of diverse organic molecules from inorganic constituents) = ½ + ½

He created reducing / early atmospheric condition by taking a closed flask , containing CH_4 (Methane) H_2 (Hydrogen) NH_3 (Ammonia) and water vapour , at 800 °C , subjecting them to electric discharge and observed formation of aminoacids /organic compounds = ½ × 4

[1 + 2 = 3 marks]

21. Name the two primary lymphoid organs in humans. Explain their functions in providing immunity.

Ans. Bone marrow , Thymus = ½ = ½

Immature lymphocytes differentiate into antigen sensitive lymphocytes , provide microenvironments for the development and maturation of T-lymphocytes (lymphocytes are produced in bone marrow) = 1 + 1

[1 + 2 = 3 marks]

SECTION D

Q. Nos. 22 - 24 are of three marks each

22. Tigers inhabit forests. Over the past many decades the tiger population was on the decline in our country. A project 'Save Tiger' was launched in 1973 to conserve this precious species. It is heartening to see in the last couple of decades that there has been a gradual increase in the tiger population in our country.

Answer the questions :

(a) Mention one major cause responsible for the decline in tiger population.

(b) Write one main effort of the biodiversity conservationists that must have helped in the increase in tiger population.

(c) State how it is possible to count the number of tigers in a forest area.

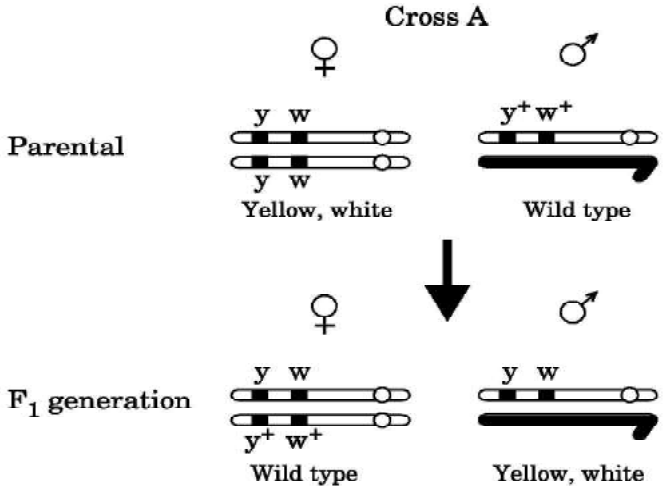
Ans. (a) Habitat loss and frgmentation / prey depletion = 1

(b) Through *in situ* conservation like national parks / wild life sanctuaries / protect biodiversity hot spots / biosphere reserves / *ex situ* conservation like zoological parks / zoo/ wild life safari parks / cryopreservation = 1

(c) Based on pug marks / faecal pellets / sites with scratches on trees are choosen for installing camera / since each tiger has a very unique stripe pattern hence this is used to differentiate one tiger from the other = 1

[1 + 1 + 1 = 3 marks]

23. T.H. Morgan carried out a cross on Drosophila Melanogaster, involving genes for body colour (y+/y) and genes for eye colour (w+/w). Study the schematic representation of the cross upto F_1 generation and answer the questions that follow :



(a) Name the kind of cross it represents.

(b) Identify and write the dominant phenotype with respect to eye colour.

(c) What are these genes located on the chromosome shown referred to as ?

Ans. (a) Dihybrid cross = 1

(b) Red eye / phenotype of w^+ = 1

(c) Linked genes / sex linked genes = 1

[1 + 1 + 1 = 3 marks]

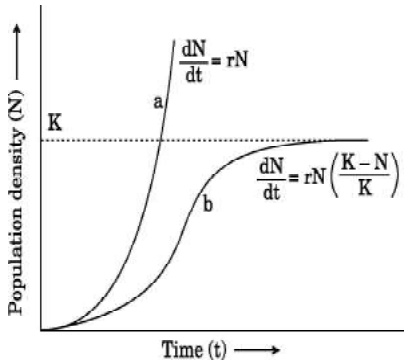
24. Study the graph given below showing the different types of growth curves of different species.

Answer the questions :

(a) Name the type of growth curve 'a' shown in the graph.

(b) State one reason why the growth curve 'b' is said to be logistic.

(c) dNWhat is 'K' representing in the equation $\frac{dN}{dt} = rN\left[\frac{K-N}{K}\right]$ given along the logistic curve.



Ans. (a) Exponential / geometric / 'J' shaped = 1

(b) Resources for growth of most animals populations are finite and become limiting sooner or later = 1

(c) Carrying capacity = 1

[1 +1 +1 = 3 marks]

SECTION E

Q. Nos. 25- 27 are of five marks each

25. List the different components of a Lac Operon. Explain the role of these components, when the operon is in an 'open state'.

Ans. Components : Regulatory gene / the *'i'* gene (inhibitor) ,

and three structural genes i.e. *z*, *y*, and *a* = ½ × 4

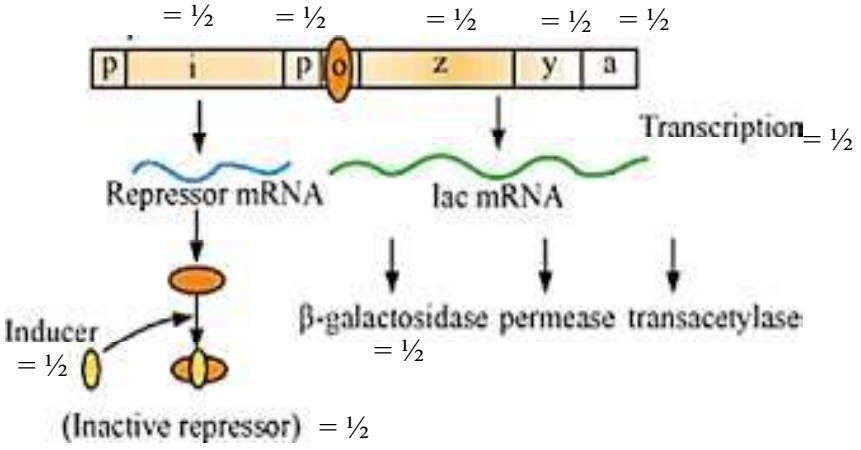
Repressor , which is synthesised (all-the-time – constitutively)from the ***i*** gene, is inactivated by interaction with the inducer (lactose or allolactose) , this allows RNA polymerase access to the promoter , turning on the transcription of these three genes in the lac operon , which in turn producing

enzymes responsible for digestion of lactose (β galactosidase break lactose to glucose and galactose) = ½ × 6

[2 + 3 = 5 marks]

//

(In lieu of the above explanation , the following diagram with the given marking point can be considered)



Lactose → Glucose + Galactose = ½

[½ × 10 = 5 marks]

OR

Write the five important goals of Human Genome Project (HGP).

Ans. (i) Identify all the approximately 20,000 - 25,000 genes in human DNA

(ii) Determine the sequences of the 3 billion chemical base pairs that make up human DNA

(iiii) Store this information in databases

(iv) Improve tools for data analysis

(v) Transfer related technologies to other sectors, such as industries

(vi) Address the ethical, legal, and social issues (ELSI) that may arise from the project

(any five) 1×5=5

[1 × 5 = 5 marks]

26. (a) Describe the different stages of development a fertilised ovum in a human female undergoes up to the blastocyst stage.

(b) Name the parts of a blastocyst and write the fate of these parts till the onset of pregnancy.

Ans. (a) Zygote moves through the oviduct towards uterus , and the mitotic division called cleavage begins , forms 2- 4- 8- 16 daughter cells , called blastomeres, the embryo with 8 to 16 blastomeres is called a morula , the morula continues to divide and transforms into blastocyst = ½ × 6

(b) Trophoblast = ½ , gets attached to the endometrium for implantation / helps in formation of placenta , = ½

Inner cell mass = ½ , the inner cell mass gets differentiated as the embryo = ½

[3 + 2 = 5 marks]

OR

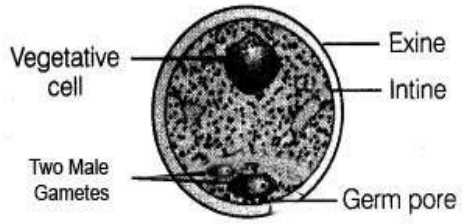
(a) Name the specific part in the anther and the process responsible for the development of a male gametophyte in an angiosperm.

(b) Draw a labelled diagram of a mature male gametophyte (3-celled) of an angiosperm. Write the functions of each labelled part.

Ans. (a) Sporogenous tissue / Microsporangium / Microspore mother cell / Pollen mother cell / PMC = 1,

Microsporogenesis = 1

(b)



(Any labellings) = ½ + ½

Vegetative cell - It has abundant food reserve

Male gametes - Participate in double fertilisation / one male gamete fuses with egg and the other fuses with two polar nuclei / secondary nucleus (any two)

Exine - Made up of most resistant organic material sporopollenin / can withstand high temperatures / strong acids / alkali / no enzymes can degrade it /

Intine - Contributes pollen tube formation

Germpore - Region from where pollen tube arise

(Any two parts with correct function) = 1 + 1

[3 + 2 = 5 marks]

27. (a) Construct a pyramid of biomass of grassland ecosystem. How is the pyramid of biomass in sea different from it ?

(b) Name the primary producer and primary consumer in sea.

(c) What is standing crop ?

(a) Pyramids of biomass in grassland ecosystem - upright, = 1

Pyramid of biomass in sea - (generally) inverted = 1

(b) Primary producers -phytoplankton = 1

Primary consumers - fishes / zooplanktons = 1

(c) Each trophic level has a certain mass of living material at a particular time called as the standing crop = 1

[2 + 2 + 1 = 5 marks]

OR

(a) What is eutrophication ? Enumerate the steps leading to eutrophication.

(b) How is accelerated eutrophication different from eutrophication ?

Ans. (a) Natural aging of a lake by nutrient enrichment of its water = 1

In a young lake the water is cold and clear supporting little life but with time streams draining into the lake introduce nutrients such as nitrogen and phosphorus , which encourage the growth of aquatic organisms , as the lake's fertility increases plant and animal life burgeons and organic remains begin to be deposited on the lake bottom , and over the centuries as silt and organic debris pile up making the lake shallower and warmer with warm-water organisms supplanting those that thrive in a cold environment , marsh plants take root in the shallows and begin to fill in the original lake basin , eventually the lake gives way to large masses of floating plants (bog) grow finally converting into land. = ½ × 6

(b)

Eutrophication	Accelerated Eutrophication
Natural	Man made
Slow Process/takes centuries	Accelerated process/ takes Few years

Any one difference = 1

[4 + 1 = 5 marks]

SECTION A

Q. Nos. 1 - 5 are of one mark each

1. The role of FSH in the process of spermatogenesis in humans is to

(A) stimulate the secretion of certain factors from Sertoli cells.

(B) inhibit the secretion of testosterone from the interstitial cells.

(C) stimulate the action of testosterone on Sertoli cells.

(D) stimulate the secretion of LH from pituitary cells.

Ans. (A) / Stimulate the secretion of certain factors from Sertoli cells

[1 mark]

2. Some cyanobacteria in aquatic and terrestrial environment that enrich the soil by fixing atmospheric nitrogen are

(A) Rhizobium and Azotobacter

(B) Azospirillum and Glomus

(C) Anabaena and Nostoc

(D) Azospirillum and Azotobacter

Ans. (C) / *Anabaena and Nostoc*

OR

Colostrum provides passive immunity to human infants as it contains antibody

(A) IgA

(B) IgM

(C) IgE

(D) IgG

Ans. (A) / IgA

[1 mark]

3. The specific site for fertilisation in human female is

(A) Infundibulum

(B) Uterus

(C) Ampulla

(D) Ampullary isthmic junction

Ans. (C) / Ampulla

// (D) / Ampullary isthmic junction

OR

The hormone that regulates the synthesis and secretion of androgens in human males is1

(A) GH

(B) FSH

(C) LH

(D) Prolactin

Ans. (C) / LH

[1 mark]

4. In biotechnology experiments, 'molecular scissors' used are

(A) Plasmid

(B) Restriction enzymes

(C) Vectors

(D) Sigma factor

Ans. (B) / Restriction enzymes

[1 mark]

5. 'Cry genes' that code for insecticidal toxins are present in

(A) Cotton bollworms

(B) Nematodes

(C) Corn borer

(D) Bacillus thuringiensis

Ans. (D) / *Bacillus thuringiensis*

[1 mark]

SECTION B

Q. Nos. 6 - 12 are of two marks each

6. Why do some organisms enter into diapause while some others into aestivation ? Give one example each of such organisms.

Ans. Diapause – To avoid unfavourable condition , eg.-Zooplankton = ½ + ½

Aestivation – To avoid summer related problem / to avoid heat / desiccation , eg.- Snail / Fish = ½ + ½

[1+ 1 = 2 marks]

7. Mendel did not explain the expression of incomplete dominance in plants. Give an example of flower exhibiting incomplete dominance.

Name and state the Law of Mendel the genes which exhibit incomplete dominance follow.

Ans. *Antirrhinum* / Snapdragon / Dog flower / Four o'clock plant / *Mirabilis jalapa* = 1

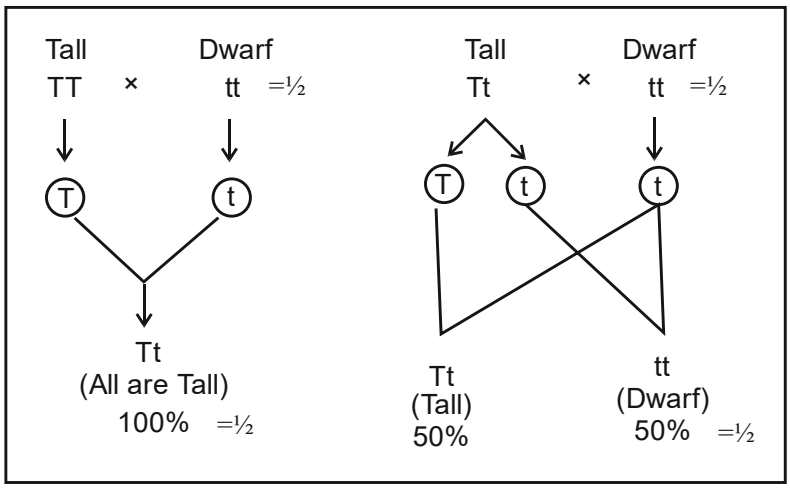
Law of segregation = ½ , Allele/factors of a pair segregate from each other such that a gamete receives only one of the two factors = ½

[1 + ½ + ½ = 2 marks]

OR

Your teacher gave you a tall pea plant and asked you to find whether the plant is homozygous tall or heterozygous tall. How will you proceed to find the genotype of the given plant ?

Test Cross



[½ × 4 = 2 marks]

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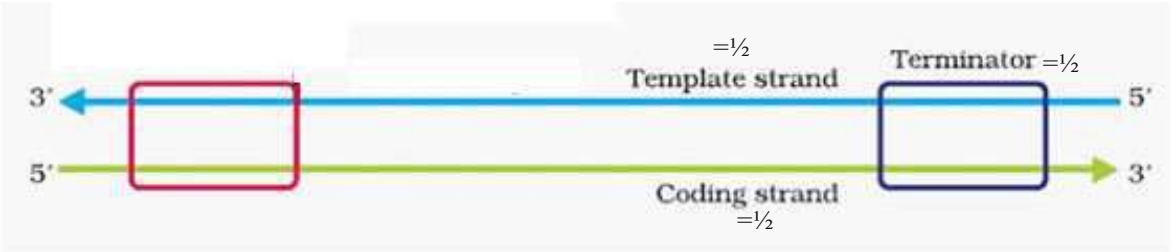


Correct polarity = ½

[½ × 4 = 2 marks]

9. **Causative organisms of some diseases gain entry into human body through mosquito bites and make humans suffer from the disease.**

Name one such :

(i) protozoan disease along with the scientific name of the causative organism.

(ii) helminthes disease along with the scientific name of the causative organism.

Ans. (i) Malaria , *Plasmodium vivax / Plasmodium malaria / Plasmodium falciparum* = ½ + ½

(ii) Elephantiasis / Filariasis , *Wuchereria bancrofti / Wuchereria malayi* = ½ + ½

[1 + 1 = 2 marks]

10. What is 'bagging' ? State its importance in artificial hybridization of flowering plants.

Ans. Bagging - Process of covering of emasculated / female / artificially pollinated flowers with a bag of suitable size generally made up of butter paper (to prevent contamination of stigma with unwanted pollen) = 1

Importance – The desired pollen grains are used for pollination / the stigma is protected from contamination from unwanted pollen / It combines desirable characters to produce commercially superior varieties = 1

[1 + 1 = 2 marks]

11. (a) Mention the difference in the level of BOD before and after the secondary treatment of sewage water.

(b) Write the importance of 'flocs' during the secondary treatment of sewage.

Ans. (a) Before - High = ½ , After – Low = ½

(b) Reduces BOD / Biochemical Oxygen Demand = 1

[1 + 1 = 2 marks]

12. Name any two cereal crops that have been fortified. Mention how.

Ans. - Maize (hybrids) = ½ , that had twice the amount of the amino acids - lysine and tryptophan =½

- Wheat (variety) Atlas 66 = ½ , for a high protein content =½
- Iron - fortified rice variety = ½ , with over five times iron (as in commonly consumed varieties) = ½

(Any two) = 1 + 1

[1 + 1 = 2 marks]

SECTION C

Q. Nos. 13 - 21 are of three marks each

13. Why does an organic farmer intentionally not use toxic chemicals to kill the pests which damage his crops ? Explain giving three reasons.

Ans. - Toxic chemicals can have adverse side effects / causes biomagnification ,

- It kills both useful and harmful life forms indiscriminately,
- It eradicates pests not control pests ,
- Beneficiary predatory and parasitic insects which depend upon them as food or hosts would not able to survive ,
- It disturbs food chain / food webs / vibrant ecosystem (Any Three) = 1 × 3

[3 marks]

14. Name the three different parts of a human sperm and write their involvement in the process of fertilisation.

Ans. Acrosome = ½ , filled with enzyme which helps the sperm to enter into the ovum (through zona pellucida)= ½

Nucleus = ½ , containing chromosomal material / genetic material = ½

Mitochondria / Middle piece = ½ , energy source for swimming = ½

Tail = ½ , it helps in movement / motility = ½

Plasma membrane = ½ , sperm is enveloped by it = ½ (Any Three) = 1 × 3

[3 marks]

15. Why do doctors suggest some married couples to go for 'IVF' ? Explain the steps carried out in the process of 'IVF'.

Ans. - (Childless) couples could be assisted to have children through IVF = 1

- Ova from the wife / donor (female) and sperm from the husband /donor(male) are collected , and are induced to form zygote under simulated conditions in the laboratory, the zygote or early embryos (with upto 8 blastomeres)could then be transferred into fallopian tube(ZIFT), and embryos with more than 8 blastomeres transferred into uterus(IUT) = ½ × 4

[1 + 2 = 3 marks]

16. Explain the events occurring in a 'Replicating Fork' during replication of DNA.

Ans. - DNA dependent DNA polymerase catalyse polymerisation ,

- of deoxynucleotides / deoxyribonucleotside triphosphates ,

- only in one direction 5'→3' ,

- on one strand (the template with polarity 3'→5') the replication is continuous ,

- while on the other (the template with polarity 5'→3') it is discontinuous,

- the discontinuously synthesised fragments are later joined by the enzyme DNA ligase = ½ × 6

[½ × 6 = **3 marks]**

OR

Name the different types of RNA polymerases in a eukaryotic cell. Write their roles in transcription.

Ans. - RNA polymerase I= ½ , transcribes rRNAs(28S/18S/5.8S) = ½

- RNA polymerase II= ½ , transcribes precursor of mRNA/hnRNA/heterogenous nuclear RNA = ½

- RNA polymerase III = ½ , transcribes tRNA/ 5srRNA/ snRNAs / small nuclear RNAs = ½

[½ × 6 = 3 marks]

17. Why are poultry farms set up ? Write the different components to be kept in mind in poultry farm management.

Ans. Used for food / meat / eggs = 1

- Selection of disease free and suitable breeds ,

- proper and safe farm conditions ,
- proper feed and water ,
- and hygiene and health care = ½ × 4

[1 + 2 = 3 marks]

18. Describe the technique that is very effectively used to get a large amount of desired DNA for research and detailed investigation.

Ans. - By using PCR (polymerase chain reaction) denaturation of desired DNA ,
- separate into 2 strands where each acting as template ,
- for each strand a separate set of primer used (two primers) ,
- with the help of deoxy(ribo) nucleotides and Taq polymearse (DNA polymearase isolated from *Thermus aquaticus)* ,
- results in extension of DNA primer = ½ × 6

[½ × 6 = 3 marks]

19. What are transgenic animals ? How are they being used for vaccine safety and chemical safety testing ? Explain.

Ans. Transgenic animals – : Animals that have had their DNA manipulated to possess and express an extra/foreign/trans gene = 1

- Transgenic mice are being developed for use in testing the safety of vaccine before they are used in humans / transgenic mice are being used to test the safety of polio vaccine , if successful and found reliable they could replace the use of monkeys to test the safety of batches of the vaccine = ½ × 2
- Transgenic animals are made that carry genes which make them more sensitive to toxic substances than non-transgenic animals , they are exposed to the toxic substances and the effects are studied (that allows to obtain results in less time) = ½ × 2

[1 + 1 + 1 = 3 marks]

20. Differentiate between pleiotropy and polygenic inheritance by taking one example of each.

Ans.

Pleiotropy	**Polygenic Inheritance**
a single gene can exhibit multiple phenotypic expression = 1	Inheritance which are generally controlled by three or more genes = 1
eg.- Phenylketonuria / mutation of a gene coding for phenylalanine hydroxylase can manifests multiple phenotypic expression(mental retardation and a reduction in hair and skin pigmentation) / a single gene in garden pea control the size of starch grain and seed shape = ½	eg.-Human skin colour controlled by three genes (A,B,C) = ½

[1 + 1 + ½ + ½ = 3 marks]

OR

State Oparin and Haldane hypothesis. How did S.L. Miller experimentally prove it ? Explain.

Ans. First form of life could have come from pre-existing non-living molecules (DNA/protein) , and that formation of life was preceded by chemical evolution (formation of diverse organic molecules from inorganic constituents) = ½ + ½

He created reducing / early atmospheric condition by taking a closed flask , containing CH_4 (Methane) H_2 (Hydrogen) NH_3 (Ammonia) and water vapour , at 800 °C , subjecting them to electric discharge and observed formation of aminoacids /organic compounds = ½ × 4

[1 + 2 = 3 marks]

21. How are the two Assisted Reproductive Technologies (ART), intracytoplasmic sperm injection and intrauterine insemination different ? Explain.

Ans.

Intra cytoplasmic sperm injection (ICSI)	IUI – intra-uterine insemination
Ovum is collected from donor female	No need of donor female
Sperm directly injected into the ovum	Sperm is introduced into vagina / uterus
Embryo formation occurs in the laboratory	Embryo formation occurs in the mother's body

[1 × 3 = 3 marks]

SECTION D

Q. Nos. 22 - 24 are of three marks each

22. Tigers inhabit forests. Over the past many decades the tiger population was on the decline in our country. A project 'Save Tiger' was launched in 1973 to conserve this precious species. It is heartening to see in the last couple of decades that there has been a gradual increase in the tiger population in our country.

Answer the questions :

(a) Mention one major cause responsible for the decline in tiger population.

(b) Write one main effort of the biodiversity conservationists that must have helped in the increase in tiger population.

(c) State how it is possible to count the number of tigers in a forest area.

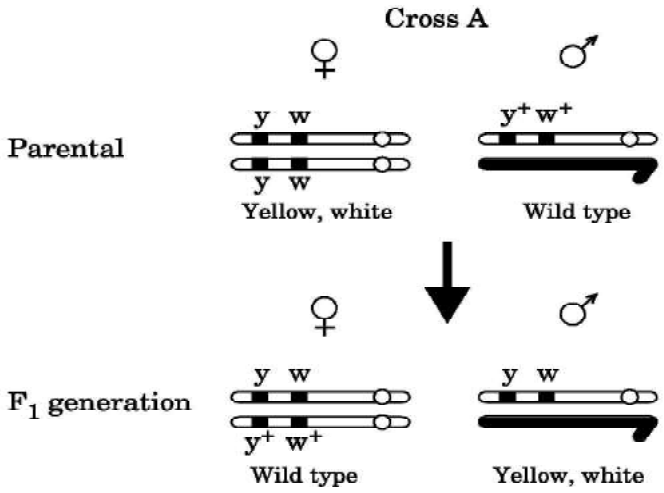
Ans. (a) Habitat loss and frgmentation / prey depletion = 1

(b) Through *in situ* conservation like national parks / wild life sanctuaries / protect biodiversity hot spots / biosphere reserves / *ex situ* conservation like zoological parks / zoo/ wild life safari parks / cryopreservation = 1

(c) Based on pug marks / faecal pellets / sites with scratches on trees are choosen for installing camera / since each tiger has a very unique stripe pattern hence this is used to differentiate one tiger from the other = 1

[1 + 1 + 1 = 3 marks]

23. T.H. Morgan carried out a cross on Drosophila Melanogaster, involving genes for body colour (y+/y) and genes for eye colour (w+/w). Study the schematic representation of the cross upto F_1 generation and answer the questions that follow :



(a) Name the kind of cross it represents.

(b) Identify and write the dominant phenotype with respect to eye colour.

(c) What are these genes located on the chromosome shown referred to as ?

Ans. (a) Dihybrid cross = 1

(b) Red eye / phenotype of w^+ = 1

(c) Linked genes / sex linked genes = 1

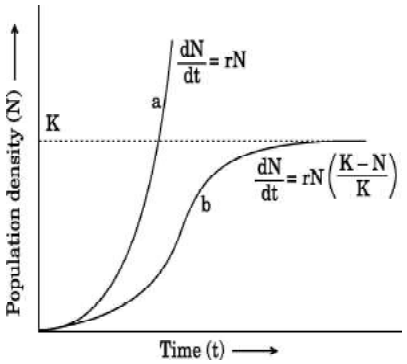
[1 + 1 + 1 = 3 marks]

24. Study the graph given below showing the different types of growth curves of different species. Answer the questions :

(a) Name the type of growth curve 'a' shown in the graph.

(b) State one reason why the growth curve 'b' is said to be logistic.

(c) dNWhat is 'K' representing in the equation $\frac{dN}{dt} = rN\left[\frac{K-N}{K}\right]$ given along the logistic curve.



Ans. (a) Exponential / geometric / 'J' shaped = 1

(b) Resources for growth of most animals populations are finite and become limiting sooner or later = 1

(c) Carrying capacity = 1

[1 +1 +1 = 3 marks]

SECTION E

Q. Nos. 25- 27 are of five marks each

25. State what is disturbance in Hardy-Weinberg equilibrium indicative of. Write any four factors that affect this equilibrium. Explain how.

Ans. (Disturbance in Hardy- Weinberg equilibrium would be interpreted as resulting in) Evolution =1

Factors :

- Gene migration / gene flow = ½ , when migration of a section of population to another place occurs then gene frequencies change in the original as well as in the new population / and it is a gene flow if this gene migration happens multiple times = ½
- Genetic drift = ½ , if the change in gene frequencies occurs by chance = ½
- Mutation = ½ , alteration of DNA sequence = ½
- Genetic recombination = ½ , non-parental gene combination / variation in the genes due to recombination during gametogenesis = ½
- Natural selection = ½ , a process in which heritable variations enabling better survival are enabled to reproduce and leave greater number of progeny =½

(Any four) = 1 × 4

[1 + 4 = 5 marks]

OR

Explain with the help of one suitable example that "Evolution is a random process based on chance events in nature and chance mutation in the organisms"

Ans. - Post industrialisation period the tree trunks became dark due to industrial smoke and soots and under this condition the white-winged moth did not survive due to predators, dark-winged or melanised moth survived, before industrialisation thick growth of almost white-coloured lichen covered the trees and in that background the white winged moth survived but the dark-coloured moth were picked out by predators = 1+1+1

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- Excess use of herbicides/ pesticides etc, has only resulted in selection of resistant varieties, in a much lesser time scale of months or years and not centuries =1+1+1

//

- Microbes against which we employ antibiotics or drugs against eukaryotic organisms /cell , and so resistant organisms/cells are appearing , in a time scale of months or years and not centuries =1+1+1

Evolution is not a direct process in the sense of determinism , it is a stochastic process (based on chance events in nature and chance mutation in the organisms) = 1 + 1

[3 + 2 = 5 marks]

26. (a) How many episodes of mass extinction since the origin and biodiversification of life on the Earth have occurred and which one is presently in progress ?

(b) How is the present one in progress different from the ones that occurred previously ?

(c) Write the concerns of the ecologists in this respect.

(d) Explain coextinction with the help of an example.

Ans. a) 'Five episodes' of mass extinction of species , the 'Sixth Extinction' presently in progress =1+1

b) It is 100 to 1,000 times faster than in the pre-human times / Human activities only responsible for it / It is anthropogenic =1

c) If the present trends continue nearly half of all the species on earth might be wiped out within the next 100 years =1

d) When a host fish species becomes extinct its unique assemblage of parasites also meets the same fate / the case of a coevolved plant-pollinator mutualism where extinction of one invariably leads to the extinction of the other =1

[2+1+1+1 = 5 marks]

OR

Explain the steps carried out in purifying the wastewater by the citizens of Arcata in the State of Northern California.

Ans. Towns people created an integrated waste water treatment process with in a natural system , cleaning occurs in two steps, (in first step) conventional sedimentation - filtering and chlorine treatment are given , still a lot of dangerous pollutant like dissolved heavy metal still remain , the biologists developed a series of six connected marshes , over 60 hectares of marshland , with appropriate plants algae , fungi , and bacteria were seeded into this , which neutralise / absorb / assimilate the pollutants , and hence as the water flows through the marshes it gets purified naturally = ½ × 10

[5 marks]

27. Trace the events that occur in an angiosperm during

(a) Pollen-pistil interaction until pollen tube enters the ovule.

(b) Double fertilisation.

Ans. a) When pollen grain lands on the pistil a chemical components of the pollen interact with those of the pistil , the pollen grain germinates on the stigma to produce a pollen tube through one of the germ pores , the contents of the pollen grain move into the pollen tube , pollen tube grows through the tissues of the stigma and style and reaches the ovary , pollen tube after reaching the ovary enters the ovule through the micropyle = ½ × 5

b) After entering one of the synergids the pollen tube releases the two male gametes into the cytoplasm of the synergid , one of the male gametes moves towards the egg cell and fuses with its nucleus thus completing the syngamy , this results in the formation of a diploid cell the zygote , the other male gamete moves towards the two polar nuclei (secondary nucleus) located in the central cell and fuses with them , to produce a triploid primary endosperm nucleus (PEN) = ½ × 5

[2 ½ + 2 ½ = 5 marks]

OR

Answer the following questions based on the process of oogenesis in human female :

(a) When and where does the process begin ?

(b) Explain the steps that occur in the process of oogenesis up to ovulation on the onset of puberty.

Ans. a) Embryonic stage , fetal ovary = ½+ ½

b) The primary follicles get surrounded by more layers of granulosa cells and a new theca and are called secondary follicles , the secondary follicle soon transforms into a tertiary follicle , which is characterised by a fluid filled cavity called antrum , at this stage that the primary oocyte within the tertiary follicle grows in size and completes its first meiotic division , (it is an unequal division) resulting in the formation of a large haploid secondary oocyte and a tiny first polar body , tertiary follicle further changes into the mature follicle or Graafian follicle, the secondary oocyte forms a new membrane called zona pellucida surrounding it , the Graafian follicle now ruptures to release the secondary oocyte (ovum) from the ovary by the process called ovulation =½ × 8

[1+4 = 5 marks]

SECTION – A

Q. Nos. 1 - 5 are of one mark each

1. In the illustration given below of a simplified food web on an island, the arrows indicate the direction of energy flow and the Roman numbers indicate species within the food web.

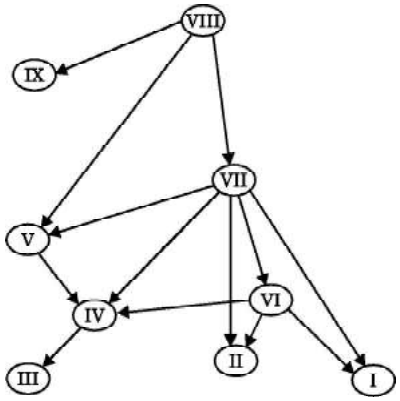
At which trophic level or levels does the species VIII function ?

(A) 2nd and 3rd consumer

(B) 1st consumer

(C) Producer

(D) 3rd and 4th consumer



Ans. (C) / Producer

[1 mark]

2. Which of the following is *not* a plasmid ?

(A) Sal1

(B) YAC

(C) BAC

(D) pBR322

Ans. (A) / Sal 1

[1 mark]

OR

Colostrum provides passive immunity to human infants as it contains antibody

(A) IgA

(B) IgM

(C) IgE

(D) IgG

Ans. (A) / IgA

[1 mark]

3. The specific site for fertilisation in human female is

(A) Infundibulum

(B) Uterus

(C) Ampulla

(D) Ampullary isthmic junction

Ans. (C) / Ampulla

// (D) / Ampullary isthmic junction

OR

The hormone that regulates the synthesis and secretion of androgens in human males is1

(A) GH

(B) FSH

(C) LH

(D) Prolactin

Ans. (C) / LH

[1 mark]

4. In biotechnology experiments, 'molecular scissors' used are

(A) Plasmid

(B) Restriction enzymes

(C) Vectors

(D) Sigma factor

Ans. (B) / Restriction enzymes

[1 mark]

5. 'Cry genes' that code for insecticidal toxins are present in

(A) Cotton bollworms

(B) Nematodes

(C) Corn borer

(D) Bacillus thuringiensis

Ans. (D) / *Bacillus thuringiensis*

[1 mark]

SECTION B

Q. Nos. 6 - 12 are of two marks each

6. State the cause of inbreeding depression in cattle. Mention a way to overcome it.

Ans. Continued inbreeding = 1

Mating of selected animals with unrelated superior animals of the same breed / outbreeding / breeding of unrelated animal out-crossing / Mating of animals within the same breed but having no common ancestors on either side of their pedigree up to 4-6 generations / cross breeding / superior males of one breed are mated with superior female of another breed / inter-specific hybridisation = 1

[1 + 1= 2 marks]

7. Mendel did not explain the expression of incomplete dominance in plants. Give an example of flower exhibiting incomplete dominance.

Name and state the Law of Mendel the genes which exhibit incomplete dominance follow.

Ans. *Antirrhinum* / Snapdragon / Dog flower / Four o'clock plant / *Mirabilis jalapa* = 1

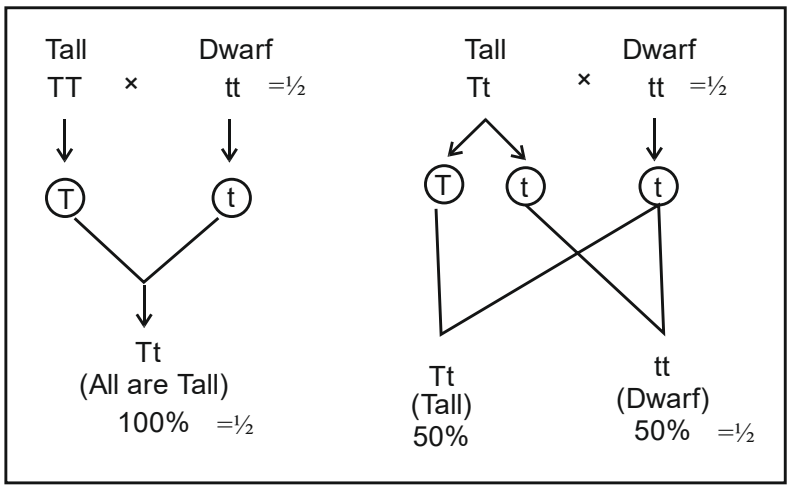
Law of segregation = ½ , Allele/factors of a pair segregate from each other such that a gamete receives only one of the two factors = ½

[1 + ½ + ½ = 2 marks]

OR

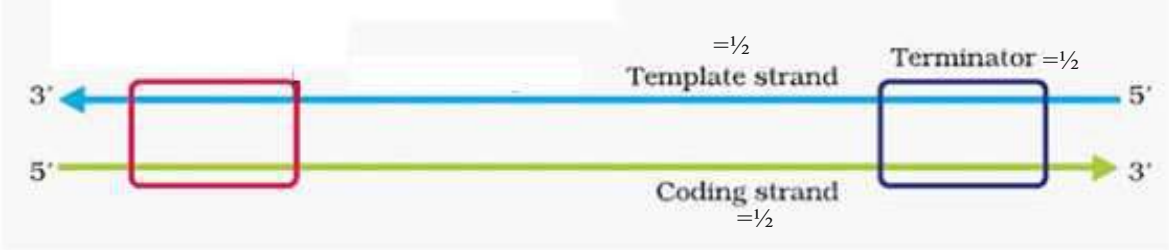
Your teacher gave you a tall pea plant and asked you to find whether the plant is homozygous tall or heterozygous tall. How will you proceed to find the genotype of the given plant ?

Test Cross



[½ × 4 = 2 marks]

8. Draw a schematic diagram of a transcription unit with the polarity of the DNA strands and label coding strand, template strand and terminator.



Correct polarity = ½

[½ × 4 = 2 marks]

9. Causative organisms of some diseases gain entry into human body through mosquito bites and make humans suffer from the disease.

Name one such :

(i) protozoan disease along with the scientific name of the causative organism.

(ii) helminthes disease along with the scientific name of the causative organism.

Ans. (i) Malaria , *Plasmodium vivax / Plasmodium malaria / Plasmodium falciparum* = ½ + ½

(ii) Elephantiasis / Filariasis , *Wuchereria bancrofti / Wuchereria malayi* = ½ + ½

[1 + 1 = 2 marks]

10. What is 'bagging' ? State its importance in artificial hybridization of flowering plants.

Ans. Bagging - Process of covering of emasculated / female / artificially pollinated flowers with a bag of suitable size generally made up of butter paper (to prevent contamination of stigma with unwanted pollen) = 1

Importance – The desired pollen grains are used for pollination / the stigma is protected from contamination from unwanted pollen / It combines desirable characters to produce commercially superior varieties = 1

[1 + 1 = 2 marks]

11. (a) Mention the difference in the level of BOD before and after the secondary treatment of sewage water.

(b) Write the importance of 'flocs' during the secondary treatment of sewage.

Ans. (a) Before - High = ½ , After – Low = ½

(b) Reduces BOD / Biochemical Oxygen Demand = 1

[1 + 1 = 2 marks]

12. Explain the action of EcoRI on DNA in rDNA technology experiment.

Ans. - It cuts vector and foreign DNA at specific sites (palindromic nucleotide sequence / GAATTC / between G & A on the opposite strands) ,

- forming sticky ends ,

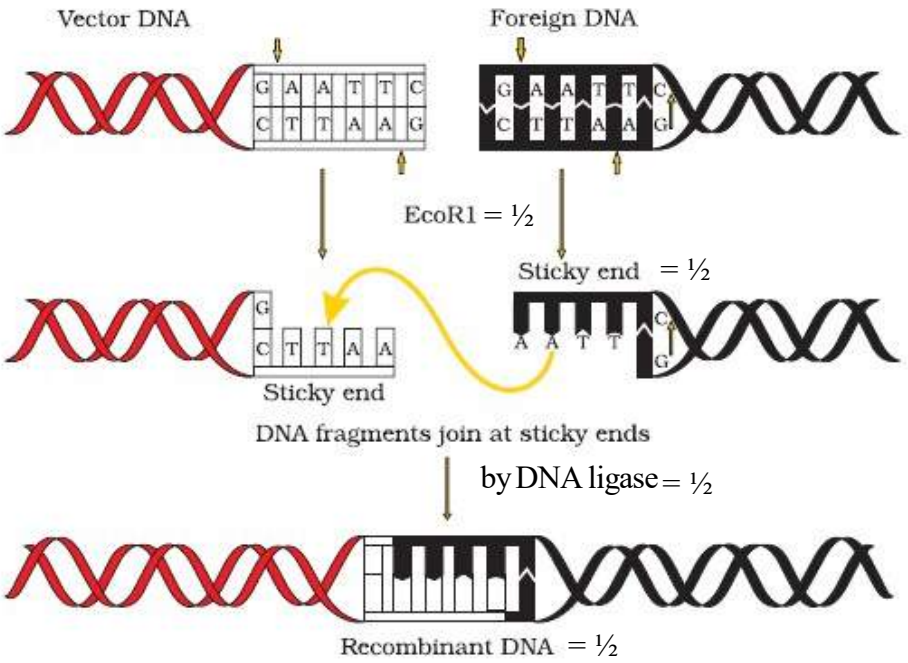
- that facilitates the action of DNA ligase ,

- to form recombinant DNA / recombinant plasmid = ½ × 4

[½ × 4 = 2 marks]

//

(In lieu of the above explanation , the following diagram with the given marking point can be considered)



[½ × 4 = 2 marks]

SECTION C

Q. Nos. 13 - 21 are of three marks each

13. How does the human body respond to an allergen ? Write the type of antibody produced by it. Name the type of drugs that can help in reducing the symptoms of allergic reactions.

Ans. Sneezing / Wheezing / Watery Eyes / Running Nose / difficulty in breathing (any two) , due to the release of chemicals like histamine and serotonin from the mast cells = ½ × 2 ,

IgE = 1

Drugs used : anti-histamine/ adrenalin/ steroids (any two) = ½ × 2

[1 + 1 +1= 3 marks]

14. Name the three different parts of a human sperm and write their involvement in the process of fertilisation.

Ans. Acrosome = ½ , filled with enzyme which helps the sperm to enter into the ovum (through zona pellucida)= ½

Nucleus = ½ , containing chromosomal material / genetic material = ½

Mitochondria / Middle piece = ½ , energy source for swimming = ½

Tail = ½ , it helps in movement / motility = ½

Plasma membrane = ½ , sperm is enveloped by it = ½ (Any Three) = 1 × 3

[3 marks]

15. Why do doctors suggest some married couples to go for 'IVF' ? Explain the steps carried out in the process of 'IVF'.

Ans. - (Childless) couples could be assisted to have children through IVF = 1

- Ova from the wife / donor (female) and sperm from the husband /donor(male) are collected , and are induced to form zygote under simulated conditions in the laboratory, the zygote or early embryos (with upto 8 blastomeres)could then be transferred into fallopian tube(ZIFT), and embryos with more than 8 blastomeres transferred into uterus(IUT) = ½ × 4

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- the discontinuously synthesised fragments are later joined by the enzyme DNA ligase = ½ × 6

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Ans. - RNA polymerase I= ½ , transcribes rRNAs(28S/18S/5.8S) = ½

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Ans. First form of life could have come from pre-existing non-living molecules (DNA/protein) , and that formation of life was preceded by chemical evolution (formation of diverse organic molecules from inorganic constituents) = ½ + ½

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[1 + 2 = 3 marks]

21. Name the two primary lymphoid organs in humans. Explain their functions in providing immunity.

Ans. Bone marrow , Thymus = ½ = ½

Immature lymphocytes differentiate into antigen sensitive lymphocytes , provide microenvironments for the development and maturation of T-lymphocytes (lymphocytes are produced in bone marrow) = 1 + 1

[1 + 2 = 3 marks]

SECTION D

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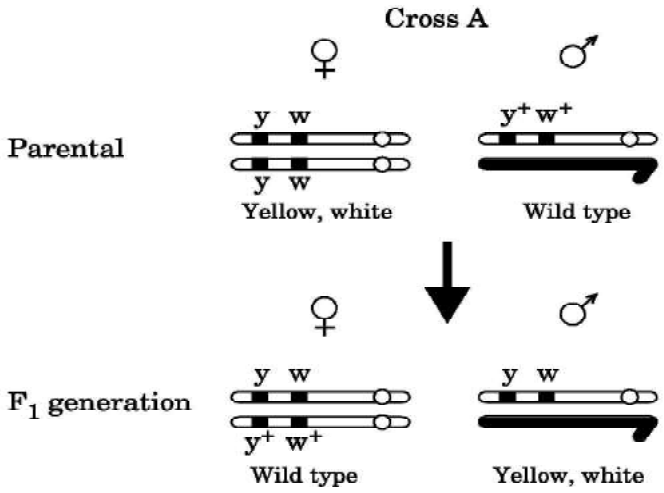
[1 + 1 + 1 = 3 marks]

23. T.H. Morgan carried out a cross on Drosophila Melanogaster, involving genes for body colour (y+/y) and genes for eye colour (w+/w). Study the schematic representation of the cross upto F_1 generation and answer the questions that follow :



(a) Name the kind of cross it represents.

(b) Identify and write the dominant phenotype with respect to eye colour.

(c) What are these genes located on the chromosome shown referred to as ?

Ans. (a) Dihybrid cross = 1

(b) Red eye / phenotype of w^+ = 1

(c) Linked genes / sex linked genes = 1

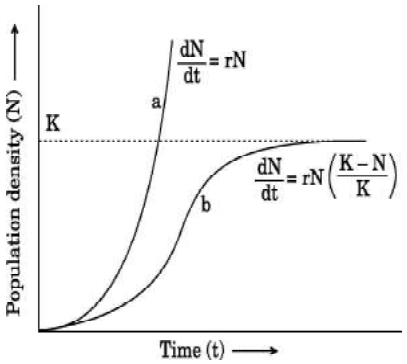
[1 + 1 + 1 = 3 marks]

24. Study the graph given below showing the different types of growth curves of different species. Answer the questions :

(a) Name the type of growth curve 'a' shown in the graph.

(b) State one reason why the growth curve 'b' is said to be logistic.

(c) dNWhat is 'K' representing in the equation $\frac{dN}{dt} = rN\left[\frac{K-N}{K}\right]$ given along the logistic curve.



Ans. (a) Exponential / geometric / 'J' shaped = 1

(b) Resources for growth of most animals populations are finite and become limiting sooner or later = 1

(c) Carrying capacity = 1

[1 +1 +1 = 3 marks]

SECTION E

Q. Nos. 25- 27 are of five marks each

25. Compare the mechanism of sex determination in humans, honeybees and birds.

Ans.

Human	**Birds**	**Honey bee**
XX – XY type of sex determination = ½	ZW – ZZ system of sex determination = ½	Haplodiploid system of sex determination = ½
Male heterogamety Male XY / Female XX =½	Female heterogamety Male ZZ / Female ZW =½	Male is haploid Female diploid = ½
When sperms with X chromosome fertilizes egg(X) it produces female offspring (XX)and when sperms with Y chromosome fertilizes egg it produces male offspring (XY) =½	When egg with Z chromosome is fertilized by sperms (Z) it produces male offspring (ZZ)and when egg with W chromosome is fertilized by sperms it produces female offspring(ZW) =½	When egg with 16 chromosomes is fertilized by sperm with 16 chromosomes it produces female with 32 chromosomes = ½ whereas the males with 16 chromosomes develop by parthenogenesis from unfertilized egg (16 chromosomes) =½

[½ × 10 = 5 marks]

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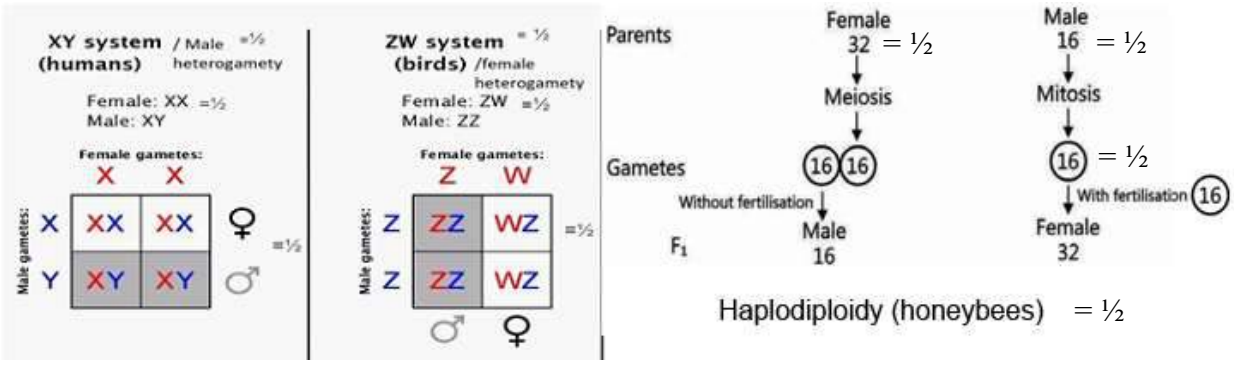
(In lieu of the above difference the following crosses with the given marking points can be considered)



[½ × 10 = 5 marks]

OR

(a) Write the symptoms of Thalassemia in humans. How is the disease caused ? Explain.

(b) Thalassemia and sickle cell anemia are both blood related diseases in humans but very different. How ?

Ans. a) Symptom: Anaemia =1

The defect could be due to either mutation or deletion which ultimately results in reduced rate of synthesis of one of the globin chains (α and β chains) that make up haemoglobin , this causes the formation of abnormal haemoglobin molecules, α Thalassemia is controlled by two closely linked genes HBA1 and HBA2 on chromosome 16 of each parent and it is observed due to mutation or deletion of one or more of the four genes (alleles) , β Thalassemia is controlled by a single gene HBB on chromosome 11 of each parent and occurs due to mutation of one or both the genes (alleles) = ½ × 4

b) Thalassemia - quantitative problem , synthesis of lesser globin molecules , = ½ × 2

Sickle-cell anaemia - qualitative problem , synthesis of an incorrectly functioning globin = ½ × 2

[3 + 2= 5 marks]

26. (a) What is ecological succession ?

(b) How is ecological succession which starts on bare rocks/area different from ecological succession which begins in an abandoned farmland ?

Ans. a) The gradual and fairly predictable change in the species composition of a given area is called ecological succession =1

b)

	Ecological succession on bare rocks/ area	**Ecological succession on abandoned farmland**
1	Primary Succession	Secondary succession
2	No soil is present at the beginning	Some soil or sediment is present
3	Succession is very slow / takes several hundred to several thousand years	Succession is faster than primary succession
4	Lichens and then the bryophytes are the first species to invade	Species that invade depend on the condition of the soil / availability of water / the environment as also the seeds or other propagules present

(Any four corresponding relevant points) =1 × 4

[1 + 4 = 5 marks]

OR

(a) With the help of suitable examples, describe the following interactions in a living community:

(i) Parasitism

(ii) Commensalism

(iii) Predation

(iv) Competition

(b) Mention one common characteristic that exists amongst organisms showing commensalism, predation and parasitism types of interactions.

Ans. a) i) **Parasitism:** Interaction between species when the parasite species gets shelter and derives nutrition from the host and is benefited whereas the host is always harmed as there is reduction in survival , growth reproduction and population density of the host = ½

eg. The human liver fluke (a trematode parasite) depends on two intermediate hosts (a snail and a fish) to complete its life cycle / The malarial parasite needs a vector (mosquito) to spread to other hosts/ many marine fish are infested with ectoparasitic copepods/ Parasitic plant *Cuscuta* is commonly found growing on hedge plants has lost its chlorophyll and leaves in the course of evolution derives its nutrition from the host plant / endoparasites that live inside the host body at different sites like liver, kidney, lungs, red blood cells, etc./ parasitic bird cuckoo lays its eggs in the nest of its host crow and lets the host incubate them / lice on human / ticks on dogs
(Any one relevant example) = ½

ii) **Commensalism:** This is the interaction in which one species benefits and the other is neither harmed nor benefited =½

eg. An orchid growing as an epiphyte on a mango branch while the mango tree derives no apparent benefit / barnacles growing on the back of a whale benefit while the whale derives no apparent benefit/ the egrets always forage close to where the cattle are grazing because the cattle as they move stir up and flush out insects from the vegetation that otherwise might be difficult for the egrets to find and catch / sea anemone that has stinging tentacles and the clown fish that lives among them gets protection from predators which stay away from the stinging tentacles and the anemone does not appear to derive any benefit by hosting the clown fish (Any one relevant example) = ½

iii) **Predation:** Interaction in which the prey species is eaten by the predator and it is the conduit for energy transfer across trophic levels = ½

eg. the tiger eats the deer / sparrow eating any seed / herbivores or animals eating plants (Any one relevant example) = ½

iv) **Competition:** Interaction between two closely related or unrelated species that competes for the same resource = ½

eg. in some shallow South American lakes visiting flamingoes and resident fishes compete for their common food, the zooplankton in the lake / the Abingdon tortoise in Galapagos Islands became extinct within a decade after goats were introduced on the island apparently due to the greater browsing efficiency of the goats/ on the rocky sea coasts of Scotland the larger and competitively superior barnacle *Balanus* dominates the intertidal area, and excludes the smaller barnacle *Chathamalus* from that zone (any one relevant example) = ½

b) One of the interacting species is always benefitted / the interacting species live closely together = 1

[4 + 1=5 marks]

27. Where does megasporogenesis begin in an ovule of an angiosperm ? Describe the process up to the development of a mature embryo sac.

Ans. (In the micropylar region of the) nucellus = 1

The megaspore mother cell / MMC undergoes meiotic division, one of the megaspores is functional while the other three degenerate, the nucleus of the functional megaspore divides mitotically forming the 2-nucleate, 4-nucleate and later the 8-nucleate stages of the embryo sac, six of the eight nuclei are surrounded by cell walls and organised into cells and the remaining two nuclei called polar nuclei are situated below the egg apparatus in the large central cell, two synergids and one egg cell are grouped together at the micropylar end and constitute the egg apparatus, three cells are at the chalazal end and are called the antipodals, a typical angiosperm embryo sac at maturity though 8-nucleate is 7-celled = ½ × 8

[1+4=5 marks]

OR

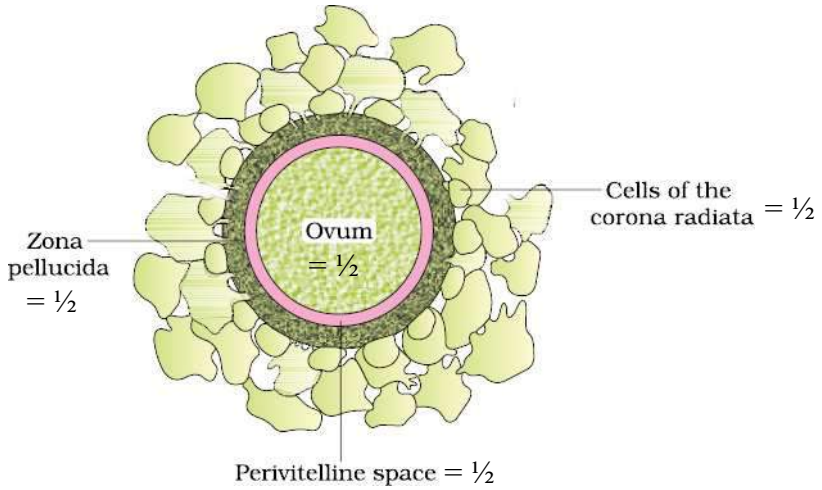
(a) Differentiate between spermatogenesis and oogenesis in humans starting from primary spermatocyte and primary oocyte up to the respective gamete formation.

(b) Draw a labelled diagram of a human ovum.

Ans.

Spermatogenesis	Oogenesis
1st meiotic division occurs at puberty	1st meiotic division occurs at embryonic stage
Meiotic division is equal to	Meiotic division is unequal
Formation of four spermatids / sperms after meiosis II	Formation of one ovum after meiosis II
No formation of polar body	Formation of polar body

(Any three corresponding differences) = 1 × 3



= ½ × 4

[3 + 2 = 5 marks]